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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION DESIGN-BUILD PILOT PROJECT EVALUATION INITIAL PROGRESS REPORT

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of Civil and Environmental Engineering

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CREDIT SHEET

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission or Department of Transportation. This report does not constitute a standard, specification, or regulation.

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Executive Summary

Purpose of the Report

This is a preliminary progress report for the Washington State Department of Transportation (WSDOT) Design-Build (D-B) Pilot Program Evaluation. The purpose of this report is to demonstrate the evaluation team's understanding of the WSDOT D-B process, report on similar studies for other State DOT D-B programs, provide refinement to the proposed scope of the evaluation and discuss obstacles and concerns for the continuing evaluation. This report was written by Dr. Keith Molenaar and Justin Sencer with information provided from Dr. Ralph Ellis and the WSDOT D-B Pilot Project team.

WSDOT Design-Build Process

This report includes a brief summary of the WSDOT process to demonstrate the evaluation team's understanding. Information used for this process description includes reports provided by the WSDOT D-B team, literature review done by the evaluation team and conversations with stakeholders. Appendix I provides a bibliography of sources consulted. Copies of the references can be obtained through the evaluation team. Subsequent evaluation reports will include a more detailed description of the process.

Measurement Criteria

Substantial progress has been made towards measurement criteria definition, but the measurement criteria will not be finalized until the Evaluation Work Plan is complete in November. The definition of measurement criteria a critical element of this evaluation. Numerous obstacles have been identified and are detailed in this report. A summary of the original criteria, the additions or refinements and the obstacles are listed below.

Original Measurement Criteria	Additional or Refined Criteria	Obstacles and Concerns
<ul style="list-style-type: none"> • Overall project cost • Overall project schedule • Elapsed calendar time comparison • WSDOT staff time comparison • Comparisons of the above at key project milestones • Design-build benefit expectations vs. realization • Required investment • Engineering bid items to compare with estimated costs • Project delivery time 	<ul style="list-style-type: none"> • IFB Time vs. RFP Time • Participant Feedback on the Selection Process • Total Design Costs for D-B vs. D-B-B Process • Removal of Alternative Designs from WSDOT's Scope • QA/QC Plan for Design • QA/QC Plan for Construction • Changes to the Contracting Process • Determine Where Design-Builders Were Able to Compress the Schedule • Traffic Impacts Under D-B Versus D-B-B 	<ul style="list-style-type: none"> • Availability of Data from Similar D-B-B Projects • Accuracy of Actual Design Costs • Impacts of Warranties • Stakeholders Participation

Other State Design-Build Reports

This report contains a summary of how other States have approached the D-B process. Documentation from New Jersey, Utah, Florida, South Carolina, Indiana, Colorado, Arizona, and Ohio were reviewed as an initial step towards the creation of evaluation measurement criteria. These documents were evaluated

for State D-B process, evaluation criteria and similarity to the WSDOT D-B evaluation scope. These other evaluations will be used to benchmark the WSDOT Design-Build Pilot Program evaluation.

Process Model

The evaluation team is developing a process model of the D-B Pilot projects and similar D-B-B projects. Process modeling is a methodology employed to decompose complex processes into measurable elements. The process models offer a detailed understanding of the differences between the two delivery methods. The models enable the evaluation team to quantify WSDOT management time and account for project variability through computer simulation. The computer simulation of the processes will yield a sensitivity analysis to determine the most critical element of the process. The final analysis will show exactly where D-B benefits or burdens the WSDOT staff. This information will allow the Department to make informed decisions about the D-B affects on worker staffing and workload leveling.

Progress Plan

The evaluation is proceeding on schedule. The original evaluation schedule is included in Appendix II. The Evaluation Work Plan will be complete in November and will detail the exact measurements and methodologies needed to complete this evaluation. The evaluation team's next steps are to continue to work with WSDOT to define the measurements, develop a baseline for D-B-B costs from completed projects and collect relevant stakeholder comments as the D-B Pilot projects progress.

Introduction

This is a preliminary progress report for the Washington State Department of Transportation (WSDOT) Design-Build (D-B) Pilot Program Evaluation. This is the first of four interim reports to be delivered before the final report in November 2001 or three months after the completion of the last pilot project. The purpose of this preliminary progress report is to demonstrate the evaluation team's understanding of the WSDOT D-B process, report on similar studies for other state DOT D-B programs, provide refinement to the proposed scope of the evaluation and discuss obstacles and concerns for the continuing evaluation. For a complete explanation of the proposed evaluation scope, please refer to Design Build Pilot Project Evaluation Agreement #GCA 1721.

WSDOT is engaging in a D-B Pilot Program to investigate the effectiveness of the D-B delivery process for the State of Washington. D-B is categorized as an alternative delivery method because current legislation does not permit the combination of design and construction under one contract. The Washington State Legislature authorized approval for this pilot program in 1998 under Substitute Senate Bill (SSB) 6439. WSDOT is investigating D-B to determine how D-B might benefit the State of Washington. D-B research emphasizes the potential for innovative project solutions and reduced construction time due to the interaction between design and construction. One of the expected outcomes of the pilot projects is the identification of legislative changes that would permit D-B contracting to be used for the delivery of future projects. If the method is found to provide benefits for WSDOT and the public, the necessary legislative changes will be recommended to the Washington Legislature.

WSDOT has contracted with Dr. Keith Molenaar of the Georgia Institute of Technology to provide an independent evaluation of the WSDOT Design-Build Pilot Process. Dr. Molenaar is an Assistant Professor in the Construction Engineering and Management Program of the School of Civil & Environmental Engineering. The independent evaluation will determine the level of effectiveness achieved by the D-B process for the State of Washington.

Scope of Evaluation

Objectives

The objectives of this study are to provide a real-time external evaluation of D-B process performance and make recommendations on the future use of this innovative delivery method for WSDOT. This study will consist of defining measurements and collecting data in order to provide an independent performance assessment of the WSDOT pilot projects. The results of this assessment will provide data and analysis to support the improvement of the D-B process. Recommendations for future use of this delivery process will be included in the evaluation.

The evaluation will compare current Design-Bid-Build (D-B-B) practices to the D-B process. Empirical cost, schedule and quality data from completed D-B-B projects will be compiled for comparison with the D-B Pilot Projects. Additionally, evaluations will include comments of the stakeholders by way of interviews and questionnaires to report their reactions to the program.

The findings of the independent evaluation will be presented to the WSDOT Design-Build Steering Committee, the Washington State Transportation Commission and the Legislative Transportation Committee of the Washington State Legislature.

Milestones

Information gathered during the independent evaluation will be periodically reported to WSDOT. Findings will be divided into a number of stages, each with deliverables to be presented to WSDOT personnel. The reporting schedule of deliverables is as follows:

Reporting Deliverable	Due Date
1. Initial Progress Report	June 1, 1999
2. Evaluation Work Plan	November 1, 1999
3. Interim Progress Report	November 1, 2000
4. Draft Report	October 1, 2001
5. Final Report	November 1, 2001

- 1. Initial Progress Report:** The present report is the embodiment of the first deliverable. This report includes a summary of the evaluation team's understanding of the WSDOT D-B process, a critical review of other State DOT's D-B findings, refinements to the proposed evaluation scope, a discussion of obstacles and concerns for the continuing evaluation, minutes from the initial WSDOT/Evaluation Team meeting and a draft process model of the WSDOT Design-Build process.
- 2. Evaluation Work Plan:** The evaluation procedures for determining D-B performance will be outlined in the Evaluation Work Plan deliverable. The measurement variables for the D-B projects, data gathering procedures that will be incorporated into the design and construction stages of the projects, and a sequenced schedule of evaluation activities will be detailed. D-B Pilot Programs will be compared to historic WSDOT road construction data. This historical data is categorized into areas of related information. The Evaluation Work Plan will specify how and to which categories of historic data the D-B projects will be compared.
- 3. Interim Progress Report:** The interim progress report will present the findings of the above historical data analysis. Preliminary findings from the D-B work completed to date will be included in the report.
- 4. Draft Report:** The draft report will contain all of the findings and recommendations from the WSDOT D-B Pilot Program evaluation. Feedback from qualitative surveys of staff and stakeholders involved with the D-B projects and the quantitative analysis of historical D-B-B data will be presented.

WSDOT will review this material for content and approval before the final report is prepared and presented.

5. **Final Report:** This document will be the final submittal of the evaluation. It will summarize all conclusions and recommendations developed for the WSDOT D-B Pilot Program. These findings will be presented to the WSDOT Steering Committee, the Washington Transportation Commission and the Legislative Transportation Committee of the Washington State Legislature.

Although the evaluation team will be working closely with the WSDOT D-B pilot project members, this study will be completed from an independent and objective perspective. The evaluation team is employing rigorous scientific methods to ensure that accurate and unbiased conclusions are reached in regard to the efficiency and effectiveness of the D-B process.

WSDOT DESIGN-BUILD PROCESS

D-B Process Summary

A WSDOT road construction project must meet certain criteria before it will be considered for the Design-Build Pilot Program. A project is eligible for the D-B process after it has developed to the point where a number of design solutions to a road deficiency have been proposed and one has been selected. To be eligible, the project must be valued in excess of \$10 million, involve highly specialized construction activities, offer the opportunity for innovation and hold the potential for savings in delivery time.

Once a project is selected for D-B, a project description and Scope of Work are defined by WSDOT. This represents a significant effort by WSDOT staff and consultants. During the development of the D-B process, WSDOT investigated the question of risk allocation and determined that high-risk areas such as environmental studies, permit acquisition, public involvement, right-of-way acquisition and utility relocation agreements should remain with WSDOT. As a result, WSDOT is responsible for the preliminary decisions that define the basic project design. The advantage of this risk allocation method is that the Design-Builder does not have to assume responsibility for potentially costly risks. The price of this security is a muted opportunity for innovation, as many of the design decisions are made prior to the selection of a Design-Builder. When risk allocation to the Design-Builder is appropriate, such as when a significant potential for innovation is present, WSDOT will allocate some of the high-risk areas to the Design-Builder.

The first step before selecting a Design-Builder is the project scope definition. WSDOT defines the project scope by collecting base data and performing an analysis of the transportation deficiency. Base data includes site survey control, traffic analysis, environmental investigations and geotechnical investigations. Design-Builder involvement in the early stages of project development, such as the environmental investigation, will require special programs and contractual arrangements. The selection and timing of Design-Builder at this stage of development is complicated by the high probability of project scope changes. WSDOT will consider when to involve a Design-Builder in the project on a case by case basis.

Preparation for Design-Builder selection follows scope definition. WSDOT staff incorporates selection criteria into a Proposal of Qualifications (POQ) and a Request for Proposal (RFP). A selection committee, responsible for evaluating the responsiveness of the Design-Builders, is established at this point in the process. The selection process consists of two steps:

1. Pre-qualification of potential Design-Builders; and,
2. Final selection from short-list of proposing Design-Builders.

The two-step selection process begins with advertising the project for a set period of time. Firms responding to the advertisement are sent a RFQ that details criteria for pre-qualifying firms. The interested firms prepare a Proposal of Qualifications (POQ) that addresses the firm's ability to meet the pre-qualification criteria listed in the RFQ. WSDOT compares the POQs to the selection criteria and creates a short-list of between 3 and 6 Design-Builders that will be most competitive in the second step.

An RFP is then sent to the short-list of Design-Builders and they are given a fixed period of time to complete the proposal. The Design-Builders then present the proposal in two separate submittals, a technical proposal describing their design solution and a price proposal that represents the total cost to WSDOT for the project delivery. WSDOT staff is available to answer questions regarding the proposals during the preparation period. Answers prepared for the Design-Builders are to be kept in strict confidence unless the questions deal with an item that will necessitate a change in the project description or the Scope of Work. Confidentiality of these questions is paramount to the Design-Builders so that they can maintain a competitive advantage with their unique proposal responses.

The technical and price components of the proposals are separated when they are received. The selection committee will evaluate the technical proposal and assign a technical score based on selection criteria detailed in the RFP. Selection criteria will vary between projects, but they will consist of items such as previous experience of the Design-Builder, key personnel, construction schedule, etc.

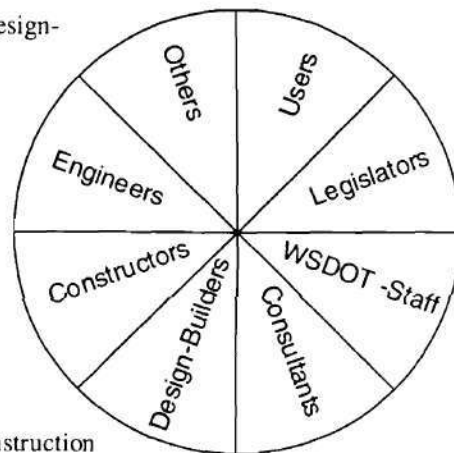
After the technical scores have been assigned, the price component of the proposal is opened and the "Best Value" proposal will be determined using the following formula:

$$\text{Best Value Score} = \text{Technical Score} * 10,000,000 / \text{Lump Sum Price}$$

The Design-Builders not awarded the project will be compensated with a stipend to be determined for the project under consideration. The winning proposal is the one with the highest Best Value score. WSDOT will then negotiate a final contract.

Stakeholders

Stakeholders are the people or groups that will be affected by this Design-Build Pilot Program. Government agencies influence the actions of many people. To gain public trust, these agencies must solicit input from a variety of groups. This input creates a sense of public ownership in the programs and policies of the agencies. The stakeholders provide a diverse set of interests and objectives that can be used as a proving ground for government programs. The stakeholders for this project are the users, government staffers, consultants, Design-Builders and legislators who are shaping this new program. The following is a brief description of these groups and the roles they are expected to play.



Users

Users are the travelling public who will directly benefit from the construction of a road project. Users encompass private individuals who use the road for commuting and corporations that use the road for commerce. Users are also the taxpayers who provide funding for the construction. The users will be involved with the process through public meetings intended to gather their input on the WSDOT D-B program. Solicitation of Design-Builders can not begin until after the public has had the opportunity to comment on the project and the use of D-B for delivery.

Legislators

The Washington State Legislation created the opportunity for WSDOT to test the D-B delivery process. They enacted legislation that established criteria for the Design-Build Pilot Process. If the program is successful, the Legislators will rewrite the Washington Code to allow D-B to be available as a delivery process to WSDOT.

The Legislature also represents the users and has the responsibility of ensuring public interests are served well by the State agencies. WSDOT will be continually updating the Legislation on the progress of the Design-Build Pilot Process and the results of this evaluation.

WSDOT – Staff

Design-Build is expected to reduce WSDOT administrative staff effort during construction, but the effects on pre-construction staffing are unknown at this point. Certain design functions currently performed by WSDOT staff, such as the comparison of design alternatives, are to be transferred to the Design-Builder. WSDOT staff will expend more effort in selecting the Design-Builder than under a traditional project. The performance of D-B for WSDOT personnel will be critical to the future applications of the delivery process. State employees will be surveyed for their reactions to the process and the quantitative differences between D-B and traditional forms of project delivery.

Consultants

Consultants are considered extensions of the WSDOT staff and are responsible for generating the data to be used in the analysis of traffic solutions. They provide information on traffic movements, financing options and design alternatives. D-B will require WSDOT to assume more project risk than in traditional projects. Conceptual designs will require more detail before the project design team is contracted. Consultants will provide much of the information that will be used in defining the scope of the D-B projects.

Design-Builder

The Design-Builder will provide a **single source** of responsibility and accountability for WSDOT. A Design-Builder is the entity that will be contracted to deliver the project and is responsible for both design and construction. They are selected through combination of technical proposal evaluation and cost for project delivery. The technical proposal includes the conceptual design and the construction schedule detailing how the Design-Builder expects to deliver the Scope of Work to WSDOT. The Scope of Work, also called the design solution, is initially established by WSDOT.

Design-Builders can be arranged in a number of ways. The Design-Builder can be one company that self performs both design and construction services. Design-Builders can also be a partnership between a design firm and a contractor. Partnerships generally have one company that acts as the lead organization while the other is considered a subcontractor. It is common for the Contractor to be the lead organization in part because of their ability to obtain bonding for the project. The capital-value of D-B projects is typically greater than the insurance capacity surety companies extend to design firms. The Design-Builder in the WSDOT Design-Build Pilot Project is expected to be a contractor-led partnership between a designer and a contractor.

Engineers

The engineering community holds the responsibility of design. Engineers will develop the conceptual design presented in the proposal into the construction documents and specifications. D-B promises to integrate design and construction, allowing for faster project delivery. Engineering design under D-B will be different from the traditional experience of Washington State designers. Capturing the engineer perspective will highlight the differences of designing under D-B. Investigations into the advantages and special challenges of the new process can be gathered from experiences of the engineers.

Contractors

WSDOT expects D-B to enable those involved in the physical construction, the contractors, to have more influence during the design phase. D-B is expected to reduce construction time and limit the number of design changes by involving the contractor early in the design process. This will allow the designer to take advantage of the contractor's construction knowledge. One aspect of the Design-Build Pilot Project is the investigation of faster project delivery and feed back from the contractors building the project will provide the information on what worked and what did not work during construction.

Others

Other stakeholders in the D-B process will include the support industries that enable construction. Enterprises such as material suppliers, insurance providers and quality testing firms will contribute to the success or failure of the D-B pilot project. This delivery method is new for all the parties involved, and each can provide a perspective on D-B performance.

Measurement Criteria

Measurement Progress

This section of the report summarizes the critical refinements to the evaluation scope. The scope of the pilot program evaluation has been refined since the initial proposal in December of 1998. Specifically, WSDOT personnel and the evaluation team from Georgia Tech discussed the evaluation scope in the initial meeting on February 17, 1999. The minutes of that meeting can be found in Appendix III of this report. A detailed scope of the evaluation can be found in the Design Build Pilot Project Evaluation Agreement #GCA 1721. Additionally, on-going discussions with the WSDOT Pilot Project team and stakeholders have provided information for further defining the evaluation objectives by identifying specific areas for investigation.

Although the final measurement criteria will be detailed with the Evaluation Work Plan deliverable in November 1999, a discussion of the major decisions to date is presented in this report. The measurement criteria initially proposed are summarized as follows:

- Overall project cost;
- Overall project schedule;
- Elapsed calendar time comparison;
- WSDOT staff time comparison (development, design and construction);
- Comparisons of the above at key project milestones (data to be supplied by WSDOT);
- Design-build benefit expectations vs. realization;
- Required investment (cash flow comparisons of design-build vs. design-bid-build);
- Engineering bid items to compare with estimated WSDOT development costs; and,
- Project delivery time (development, construction and intensity).

The measurement criteria above are somewhat broad. WSDOT personnel and the evaluation team are refining these measurement criteria into more specific variables to be analyzed by this study. Some of the more significant criteria are explained below.

IFB Time vs. RFP Time: The possibility to reduce overall project delivery time is one of D-B's most significant advantages. This measurement criteria will analyze the time required to prepare Invitation for Bids (IFB) in a D-B-B project versus time to prepare Request for Proposals (RFP) in the D-B projects. There are two main elements of time in this criterion. First, what is the actual elapsed calendar time from concept to contractor selection in a typical D-B-B project versus that of a D-B project? Second, what is the WSDOT management time involved in these two scenarios? In other words, this study will quantify the effect of writing an RFP versus and IFB in terms of calendar time and management intensity. Although the use of D-B may yield a shorter calendar time to builder selection, there will likely be a more management intensive period for the WSDOT staff. WSDOT must consider both delivery time and management workload when choosing to use D-B on a particular project. Addressing this element of the D-B process will give WSDOT the knowledge to balance speed of delivery with management work leveling when selecting future D-B projects.

Participant Feedback on the Selection Process: One of the most critical aspects of the D-B process in all public sector construction is Design-Builder selection. Poor selection processes can have adverse affects on project duration, project cost, project quality and Design-Builder participation. Time savings realized from the D-B process can be lost if the selection process is too cumbersome or if it results in protests from stakeholders that feel the selection process is not equitable.

Feedback from the companies that have participated in the D-B Pilot Program selection process will be very important in establishing the D-B reaction of the Washington construction community. The

evaluation team will be questioning a number of participants for their reaction to the process. Questionnaires will be sent to three categories of companies:

1. Companies showing interest in D-B but not responding to the RFQ (See Appendix IV);
2. Companies responding to the RFP but that were not short-listed; and,
3. Companies that were short-listed but were not awarded the project.

The evaluation team will also work closely with the Design-Builder of record to gather information about their D-B experience throughout the project duration. WSDOT staff will be surveyed for their reactions to the D-B process. WSDOT time and effort will be critical elements in the recommendations that are made for the future use of D-B.

Total Design Costs for D-B vs. D-B-B Process: This criterion will measure the difference in total design costs for D-B vs. D-B-B. This is a difficult question to answer due to the numerous variables involved. From the WSDOT perspective, the overall design burden is reduced because the Design-Builder performs the majority of the design. Conversely, the conceptual design will most likely take WSDOT more time due to the detailed conceptual design requirement of the RFP. From the Design-Builder's perspective, design time can be more efficiently allocated as only the essential construction details are required, but overall design time may be increased due to the multiple design packages required in fast track construction. Knowing the overall design cost will allow WSDOT to more effectively select appropriate projects for D-B delivery in the future.

Removal of Alternative Design Comparisons from WSDOT's Scope: In the current D-B-B scenario, WSDOT management staff explores multiple designs before arriving at a final concept to let for bid. In the D-B scenario, WSDOT's time needed to explore alternative designs is greatly reduced. This criterion will measure the calendar time savings and administrative reduction associated with eliminating alternative design comparisons from the responsibility of WSDOT. WSDOT sets the Scope of Work for the RFP and the Design-Builders explore alternative designs in detail. This study will attempt to quantify this time savings to the department. WSDOT will then be better prepared to understand the workload involved with selecting projects for D-B delivery.

QA/QC Plan for Design: The Quality Assurance/Quality Control (QA/QC) process for design is radically different in D-B when compared to D-B-B. The Design-Builder has complete responsibility for correctness of plans as specified through WSDOT's Plans Preparation Manual (M 22-31) and other design standards required by the Scope of Work. WSDOT is not required to approve or formally review the design unless there is a design deviation from the intended Scope of Work. WSDOT will be taking the role of an "over-the-shoulder" reviewer for the design. WSDOT staff will be available to comment on design concurrently with its development, but these comments do not constitute an approval of design. The intention of the over-the-shoulder review is to improve design through peer review. WSDOT will, however, approve the Design-Builder's QA/QC Plan to ensure that all design is prepared with the acceptable standard of care required of designers by WSDOT.

This evaluation will measure the impacts of the redesigned QA/QC Plan for design. The intent is to empirically measure the time and cost of the new procedure, and qualitatively collect comments from the participants.

QA/QC Plan for Construction: The QA/QC Plan for construction is not as radical a change as that of design, but the process will require some unique solutions because of the combination of design and construction under one contract. Much of the same documentation currently collected under the D-B-B process will still be required under D-B, but WSDOT will need to explore passing some of the QA/QC elements to the Design-Builder. Each RFP will state the requirements for the Design-Builder QA/QC Plan. This evaluation will analyze the impacts of the changes in QA/QC procedure.

Changes to the Contracting Process: Changes to the contracting process will need to be analyzed to understand the implications of D-B delivery on WSDOT. New contract documents and contracting procedures will be drafted for the pilot projects. Some departments and personnel could be affected more

than others could. Staff time associated with drafting and administering the contract is a specific element that will be analyzed. This evaluation will attempt to measure the implications of the new contracting process in terms of staff time, administrative burden and the effects on quality.

D-B Team Organizational Structures: Design-Builders can organize in numerous functional structures. The Design-Builder may be one company with both engineering and construction functions or they may be a partnership of an engineering and construction company for one project. If the Design-Builder is a partnership, this partnership could take the form of a joint venture or a contractor-subcontractor relationship. WSDOT will not mandate a functional structure for the Design-Builders. It is anticipated that the contractor will take the lead role with the engineer acting as a subcontractor, but any of the aforementioned structures are possible. This evaluation will analyze the different structures and attempt to determine their effects on the pilot project performance.

Determine Where Design-Builders Were Able to Compress the Schedule: A determination of where the Design-Builders are able to compress the schedule will be valuable information to WSDOT. This report will measure the overall schedule impacts due to D-B. Additionally, WSDOT has requested that the specific areas of schedule compression be defined. The evaluation team will attempt to determine the most significant time savings in the process. The ultimate goal is to determine what portion of the schedule compression was due to project specific elements and what portion was due to the D-B process itself. This information will enable WSDOT to better select projects for D-B delivery in the future.

Traffic Impacts Under D-B Versus D-B-B: WSDOT may have more control over traffic impacts in the D-B-B process or the Design-Builders may deliver more innovative solutions to traffic management in the D-B process. This study will attempt to evaluate the traffic impacts of the D-B pilot projects with similar D-B-B projects. At this point, the evaluation team has yet to define if this analysis will be an empirical, qualitative or anecdotal analysis.

As previously stated, this section of the initial progress report is intended to outline the critical measurement refinements to date. These measurement criteria are still under development and a final list of measurement criteria will be presented in the Evaluation Work Plan. Solicitation of comments will continue until the Work Plan report, and the authors welcome any comments to this section.

Obstacles & Concerns

The intent of this evaluation is to provide empirical evaluations wherever possible. Significant obstacles to the evaluation are related to the quality and quantity of data available. An outline of the most significant obstacles and concerns for the evaluation team is provided below to facilitate cooperation between WSDOT and the evaluation team in overcoming these obstacles.

Availability of Data from Similar D-B-B Projects: Gathering data from D-B-B projects of similar scope to the pilot projects will be essential for a meaningful comparison of the two delivery processes. The methodology employed to compare cost, schedule and quality will be two-tiered. At the first level, the pilot project performance will be compared to the average costs of D-B-B projects from the WSDOT historic cost database. The second level will be a pairwise case study comparison with similar projects. Due to the limited number of pilot projects, this case study comparison is essential to the understanding of the causal relationships. In other words, the first level historical cost comparison will yield correlations for time, cost and quality, and the second tier will offer specific reasons for these differences. Therefore, the identification of similar projects is essential. Cooperation from both WSDOT staff and the Design-Builder will be required to ensure that accurate cost and time data is obtained for comparisons.

Accuracy of Actual Design Costs: Measurement of design costs for D-B-B projects should not be an obstacle because the design is 100% complete when the project is bid. In the D-B process, design costs will be more difficult to report due to the staggered design process. The design process in D-B is often done in a "just-in-time" fashion. The fast-track nature of D-B often requires that design be completed just ahead of construction. The challenge to the evaluation team will be to compile meaningful design costs

from the Design-Builder. Discussions between WSDOT and the local Design-Builder community have been encouraging and the Design-Builders have stated that they are willing to share design cost information. The challenge will be in gathering the design cost information in a manner that yields meaningful comparison to WSDOT's design cost records.

Impacts of Warranties: WSDOT has made a decision to utilize warranties in an effort to ensure quality. The use of warranties is not standard practice on WSDOT D-B-B projects. In fact, warranties are still considered an alternative contracting method across the country. The impacts of warranties on cost schedule and quality is still a topic of research. Warranties will add another variable to the evaluation team's scope. If the use of warranties becomes standard procedure on all D-B projects, the need to isolate their impacts becomes less critical. The problem resides in the fact that different elements of each D-B project will be warranted on a project by project basis. The evaluation team will need to work closely with WSDOT to quantify the impacts of warranties.

Stakeholders Participation: Feedback from the stakeholder community is essential to the success of this evaluation. Attending interviews and answering questionnaires may not be a top priority for many of the stakeholders. For instance, the Colorado is attempting to measure stakeholder feedback through survey methods, but they have received virtually no response to their mail-in questionnaires. The evaluation team will be sensitive to stakeholder time requirements when designing feedback questionnaires, but WSDOT communication and encouragement of the stakeholders may be more important. Given the stakeholder participation to date, the evaluation team expects good stakeholder feedback, but WSDOT must continue to actively encourage stakeholder participation throughout the process.

In summary, no obstacles have been identified to date that would prohibit the evaluation team from meeting their measurement goals. The quantity and quality of data available will drive the research design. The evaluation team will continue to seek empirical measurements before turning to qualitative measurements. Even then, the evaluation team will employ rigorous scientific methods for the qualitative measurements. The exact measurement criteria and research plan will be detailed in the November Evaluation Work Plan deliverable later this year.

Summary of Other State Reports

Summary Introduction

The Federal Highway Administration (FHWA) created the Special Experimental Program No. 14 (SEP-14) in February of 1990 at the request of a Transportation Research Board Task Force. Under this Program, State DOTs are granted permission to deviate from Federal DOT procurement statutes that require selection of Design-Builders based strictly on cost. Agencies are given the opportunity to investigate selection alternatives where criteria such as experience may be considered. The SEP-14 requires some reporting measures related to the evaluation of the alternative delivery methods, and States must still comply with State level procurement statutes.

As of October 1998, twenty states and the District of Columbia (DC) have design-build projects under SEP-14 approved or underway. These contracting agencies include: Alabama, Alaska, Arizona, California, Colorado, DC, Florida, Indiana, Hawaii, Maine, Maryland, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina and Utah. Please refer to Appendix V for a further explanation of the SEP-14 requirements.

The Design Build Pilot Project evaluation team has reviewed the D-B programs of New Jersey, Utah, Florida, South Carolina, Indiana, Colorado, Arizona, and Ohio as an initial step towards the creation of evaluation measurement criteria. These reports will be used to benchmark the WSDOT Design-Build Pilot Program evaluation. A summary of other State D-B processes, their areas of investigation and a comparison to the WSDOT evaluation are presented below.

New Jersey

The New Jersey DOT (NJDOT) began their D-B program in 1996 using the SEP-14 legislation as a framework. Due to State level legislative constraints, NJDOT developed a "Modified Design-Build" process. Under this process the lowest responsible bid based on substantially complete plans and specifications from the State is awarded the project. The plans and specifications are brought to a 15-35% level of completion by the NJDOT staff. NJDOT does not consider qualitative criteria for selection.

NJDOT does not have a systematic process of D-B evaluation. Every six months staff members investigate each D-B project for compliance with six goals:

1. Shorten delivery time;
2. Increase constructability;
3. Transfer risk;
4. Foster innovation and creativity;
5. Reduce administrative costs; and,
6. Reduce changes, disputes and claims.

The investigations are compiled into reports produced as periodic updates to the FHWA as part of SEP-14. Narratives, developed from a qualitative investigation with the program participants, detail the level of success for each project.

The NJDOT program has completed six D-B projects and four additional projects are currently under way. The scopes of the D-B projects have included sound barriers, interchange reconstruction, freeway extensions, access ramps and bridges. NJDOT investigations indicate that the Modified D-B method may not be as effective as the two-step selection process. NJDOT believes the two step selection method is more conducive to the selection of Design-Builders that are motivated to innovate and interested in avoiding disputes and changes.

Utah

The State of Utah is currently engaged in an extensive D-B project, the I-15 corridor reconstruction. The D-B proposal for the base price plus construction and maintenance options was \$1.352 billion. This D-B project represents the largest single highway contract ever awarded in the United States.

The Design-Builder selection process was very involved and required an extensive staff with multiple sub-committees. To briefly summarize the process, proposing Design-Builders prepared a technical and a price proposal. These proposals were scored separately by different teams of evaluation committees. An emphasis was placed on maintaining confidentiality and security throughout the selection process. The companies associated with the proposal under review were not made available to the members of the reviewing committees. Only a few staff members were aware of which cost proposals were associated with the technical proposals. Training sessions were used to prepare the reviewing personnel for the process and teams were instructed not to divulge technical information contained in the proposals.

After the initial proposal review and scoring, the Design-Builders were given the opportunity to revise their proposals based on evaluation comments. The revised proposals were resubmitted and assigned a new score. The revised scores were then presented to a Proposal Evaluation Board. This board recommended to a Selection Officer which proposal represented the "Best Value" for the State of Utah.

The "Best Value" designation allowed the consideration of innovative materials, processes or designs of a proposing firm to determine whether these provided more value than the alternatives provided by other teams. The Design-Builder that was selected for the I-15 corridor reconstruction was not the one with the lowest present value cost. Four independent parties reviewed the selection process and concluded that the awarded Design-Builder was selected in accordance with the predetermined selection procedures.

UDOT has hired the consulting company Carter & Burgess, Inc. to produce annual SEP-14 evaluation reports of the D-B process. The areas currently under evaluation and investigation are:

1. Quality assurance/quality control program; and,
2. Design process of the Design-Builder.

Interviews of the participants and project related documentation are the sources of data used in the analysis of these programs. UDOT plans to direct future investigations into the following:

1. Potential cost savings/implications of D-B compared to D-B-B;
2. Schedule impacts of Design-Build process;
3. Performance of the Owner Controlled Insurance Program developed for this project;
4. UDOT's public relations program;
5. QA/QC related changes during construction;
6. Comparison of UDOT D-B management structure to D-B-B;
7. Innovative construction methods, materials, and design techniques used;
8. Performance specifications;
9. Assessment of level of quality provided by performance specifications;
10. Right of Way acquisition process used by UDOT;
11. Use of innovative materials and techniques used for fills and bridge abutments;
12. Effectiveness of partnering process; and,
13. Effects of immediate payment and invoices.

UDOT awarded the contract to Wasatch Constructors, a consortium of firms that include Kiewit Pacific, Granite Construction, Washing Construction, Sverdrup Civil, and De Leuw, Cather and Company, in late March of 1997. The construction has progressed for two years. Road crews are currently preparing eleven miles of roadway for paving operations. The entire southbound side of I-15 between 6700 south and 10600 south has been paved and many access ramps have been completed. As of April 1999, 15 bridges have been completed, and over 70 bridges were under construction. The I-15 Reconstruction project is on

budget and is scheduled for completion by July 2001, three months ahead of the October 2001 completion date.

Florida

The Florida DOT awards D-B contracts based on the type of project under consideration. Bridges valued under \$10 million as well as projects with well defined scopes and little incentive for innovation are awarded on a low bid-basis, similar to the protocols of NJDOT. Projects that are not very well defined or that have a large potential for innovation are awarded on an "Adjusted Score" system similar to the "Best Value" method used by WSDOT.

The Florida D-B pilot program began in 1987 with the selection of eleven projects. In 1992 the State of Florida commissioned a study by the University of Florida (UF) to compare the D-B process with D-B-B. The UF investigators compared seven completed D-B projects to a database of more than 400 D-B-B road design and construction projects. The evaluation compared the following:

1. Construction time;
2. Design costs;
3. Construction costs; and,
4. Quantity of change orders.

The results of the study concluded that the D-B process performed better than the D-B-B process in the areas of construction time and change orders but was inconclusive concerning the ability of D-B to reduce capital expenditures.

The Georgia Institute of Technology evaluation of the WSDOT process will employ similar techniques to those used in the FDOT evaluation. Historical data of D-B-B projects will be compared to similar data found in the WSDOT pilot projects. The WSDOT evaluation will be based on quantitative data whenever possible in the comparisons of D-B to D-B-B.

FDOT is continuing to use the design-build process for project delivery. Descriptions and procedures of the D-B processes are included in Florida's Alternative Contracting User's Guide. Many projects have been completed using D-B since the original FDOT evaluation was conducted. In 1996, the Florida legislature approved a \$60 million per year innovative practices package that provides for transportation infrastructure projects. FDOT is currently accepting proposals on two new D-B projects, a prefabricated structure and a road resurfacing, rehabilitation project. Other anticipated D-B projects include a six lane bridge replacement over the St. John's River estimated at \$128 million and a High Occupancy Vehicle (HOV) lane addition to I-4 between Orlando and Altamonte Springs valued at \$40 million.

South Carolina

The South Carolina DOT operates under the SEP-14 provisions. Their D-B program was developed following the destruction of two bridges during the landfall of Tropical Storm Jerry in 1995. SCDOT experienced significant public pressure to replace these structures quickly. The investigation into D-B was prompted by the promise of rapid project delivery. SCDOT uses a two-step selection process with a RFQ and a RFP.

SCDOT compares the performance of D-B to D-B-B by comparing construction costs and schedule. SCDOT prepares in-house project cost and time estimates based on historical D-B-B data. Then they compare these estimates to the actual performance of the D-B projects. Initial findings indicate D-B accelerates delivery time. Project cost saving evidence, however, is not conclusive. SCDOT does not perform formal investigations into the implications on SCDOT management staff effort. However, progress payments to the Design-Builder are based on a percentage complete rather than a unit price. This practice eliminates the need for SCDOT project staff to perform detailed measurement on the quantities in place on the project.

SCDOT is currently completing the Conway Bypass project using D-B and two new D-B projects, SC-170 and the Carolina Parkway, are in the Design-Builder selection stage. The Conway Bypass project is a 28.5-mile facility valued at \$386 million. The two new projects involve highway and bridge construction, each valued in excess of \$100 million.

The SCDOT D-B process is still being formalized. Some of the lessons learned include the use of RFQ's, RFP's and proposal stipends. SCDOT believes lower project costs result from providing as much detail as possible to the proposing Design-Builders, especially geotechnical and permit details.

Indiana

The Indiana DOT began a D-B program under the SEP-14 legislation based on the assumption that D-B would deliver a more cost effective, value engineered project in less time and with fewer change orders. The following information was gathered from the INDOT Innovate Contracting Practices Design-Build Work Plan.

INDOT requires pre-qualification for both contractors and designers engaging in D-B projects. Design-Builders are required to submit a technical proposal and a cost proposal. The technical proposal includes preliminary plans, schedule, quality control plan and traffic control plans.

A committee of INDOT personnel assigns a project score based on 100 possible points. Proposals deemed non-responsive or those receiving a score less than 80 points are not considered further. The technical score is only used to eliminate non-responsive proposals and is not used in the final selection. The cost proposals of the responsive Design-Builders are opened after the technical proposals have been scored and the D-B project is awarded to the lowest cost proposal.

INDOT evaluates the projects after their completion for performance in the following six categories:

1. Costs;
 - Design Costs
 - Bid Costs
 - Construction Costs
 - Change Orders and Extra Work Costs
2. Time Savings;
 - Time to Retain Designer
 - Design Time
 - Review Time
 - Construction Time
3. Control Over Design;
4. Quality of Final Project;
5. Control Over Construction Procedures and Materials; and,
6. Satisfaction with Process.
 - INDOT
 - Contractor

INDOT will prepare initial, interim, and final reports on each project. The initial report is to be completed shortly after the contract is awarded and includes industry reaction to the D-B process. The final report is to be an overall evaluation of the D-B process and provide recommendations for future D-B use.

Colorado

Participation in the CDOT D-B program requires designers and contractors to be pre-qualified. Colorado selects Design-Builders on a lowest responsible bid. Pre-qualified firms prepare a technical and cost proposal for a selection committee. First, the cost proposals are opened and the apparent low bidder is determined. Then the technical proposal of this apparent low bidder is reviewed to confirm compliance

with the requirements of the project. The technical proposals of the other proposing firms are not opened unless the review of the apparent low bidder proposal is determined to be non-responsive.

The following was developed from the CDOT Colorado Project No. IR(CX) 070-3(143) Airpark Road – East Work Plan. CDOT will evaluate D-B for performance in the following areas:

1. Reducing project delivery time;
2. Reducing change orders and claims;
3. Reducing total project costs;
4. Enhancing quality;
5. Providing user satisfaction;
6. Stimulating innovation; and,
7. Permitting flexibility in designs, materials, and methods.

The evaluation of the CDOT projects makes use of historic data maintained on D-B-B projects. This data is the basis for comparison of design and construction time, change orders, claims and quality. CDOT is performing subjective post construction evaluations in the areas of innovation, coordination of trades, performance specifications and the overall D-B process.

CDOT is producing three types of reports for the D-B projects under evaluation. The first is being developed following the award of the contract and compares the proposals received to traditional D-B-B designs and bids. The second is a set of interim reports that address the progress to date, any problems encountered using D-B and a comparison to a similar project being completed using D-B-B delivery. A final report will be prepared after project completion. The final report will summarize CDOT's experience with the project under D-B and make recommendations for the future use of D-B.

CDOT has awarded five projects under the D-B program. One was the construction of a new bridge and the others were reconstruction projects. CDOT has not encountered any significant problems with the D-B delivery, and the Colorado Legislature recently passed a bill that allows the Design-Builders to be selected on a "Best Value" basis.

Arizona

In 1996 the Arizona Legislature authorized the use of D-B for two ADOT pilot projects. Designers and contractors participating in the D-B process are pre-qualified using standard ADOT procedures and must submit a Statement of Qualifications. An ADOT selection committee narrows the field of firms submitting a Statement of Qualifications to a short-list of no more than five responsive firms. The short-listed firms then prepare technical and cost proposals based on published project requirements.

First, the Technical Review Committee reviews the technical proposal and assigns a score based on predetermined criteria. Then the cost proposal is opened and divided by the technical score to obtain the "Best Value" score. Award is made to the Design-Builder with the lowest "Best Value" score.

The Arizona Legislature established a joint legislative study committee of State Senators and State Representatives. This committee will compile information on the D-B process performance. The committee will investigate the following areas:

1. D-B feasibility;
2. D-B cost effectiveness;
3. Necessary legislative changes;
4. D-B liability issues;
5. Applicability and availability of performance and payment bonds and insurance coverage for design;
6. Dispute resolution procedures;
7. Status of projects under D-B;
8. Advantages and disadvantages of D-B; and,

9. Recommendations for the D-B process.

The committee will produce interim reports on each project under review throughout the project lifecycle. A final report summarizing all recommendations on the D-B process will be presented to the Governor, the President of the Senate, the Speaker of the House of Representatives, the Secretary of State, and the Director of WSDOT of Library, Archives and Public Records following the completion of each pilot project.

ADOT has completed the first D-B project, the Phoenix-Tucson Highway Cortaro Road Interchange. The comparison of the D-B process to D-B-B has indicated savings in project delivery time. The second D-B project is valued at \$80 million and is approximately 40% complete. The scope of the project includes converting eight miles of six-lane highway into ten-lanes while maintaining traffic flow. A third D-B project will be let in June of 1999. That project will be converting 14.5 miles of a rural, two-lane road into a four-lane divided roadway.

Ohio

The Amended Substitute House Bill 107, passed in July 1995, granted the Director of Transportation the ability to establish a pilot program of six D-B projects. Projects were eligible for the pilot program if they demonstrated a straightforward design, clear scope and time sensitivity. The selected projects represent a range of road construction activities including bridge reconstruction, roadway resurfacing and new roadway construction.

Design-Builders for the six projects were selected using a one-step, low bid method. Bidding documents were distributed to all interested parties and the project was awarded to the low bidder. The Design-Builders were led by contractors with designers designated as sub-contractors.

Each project included in the ODOT trial D-B program was evaluated on the following criteria:

1. Estimated contract cost savings;
2. Estimated total project development time savings;
3. Estimated reduction in after bid, design changes;
4. Overall efficiency of the total D-B development process;
5. Quality of work;
6. Opportunities for innovative methods;
7. Advantages and disadvantages of D-B; and,
8. Recommendations for future D-B use.

The findings of these evaluations will be consolidated into interim reports and made available to ODOT Central Office and District Offices, the General Assembly, Advocacy Groups and the Federal Highway Administration.

Four of the six projects are complete and the fifth one has reached substantial completion. The ODOT experience with D-B to date indicates that significant time saving is possible, administrative and inspection time can be reduced and construction claims orders occur less frequently. ODOT believes there are a number of designers and contractors interested in participating in D-B projects based on the number of bidders and overall interest in the D-B pilot program.

Comparison to WSDOT Evaluation

All State DOTs investigating D-B are evaluating the performance of the delivery process. The following table is a comparison of investigations performed by the above States to the proposed investigation of the WSDOT process. The manner in which the DOT's are evaluating D-B is identified with the letters "A," "E," "Q," or a combination of letters.

- "A" indicates an "Anecdotal" evaluation. The DOT presents findings that are the result of informal or open interviews with stakeholders or obvious trends found through the course of completing projects.
- "E" indicates an "Empirical" evaluation or study. The DOT is pursuing a quantitative analysis of the subject. Tests are performed to gather data or historic data is used to compare present quantities. An empirical study is the result of a planned attempt to quantify the subject in question.
- "Q" indicates a "Qualitative" evaluation. The DOT is pursuing information from the stakeholders in a formalized manner such as a questionnaire or periodic, structured interviews. Attempts are made to obtain a pattern of reaction to the subject from multiple perspectives.
- Combinations of these letters will indicate that multiple approaches are being pursued in the investigation of the evaluation criteria.
- The absence of letters indicates the subject is not evaluated by that DOT.

Evaluation Criteria	Washington	New Jersey	Utah	Florida	South Carolina	Indiana	Colorado	Arizona	Ohio
A – Anecdotal									
E – Empirical									
Q – Qualitative									
Overall Project Cost	E	E	E	E	E	E	E	E	E
Total Design Cost	E	A		E	E	E	E		
Estimated WSDOT Cost vs. Price Proposal	E	A	E	E	E	E	E		E
Project Delivery Time	E	E	E	E	E	E	E	E	E
Overall Project Schedule	E	A	E	E	E	E	E	E	E
WSDOT Staff Time Comparison	E,Q	A	Q	E	E				E
IFB Time vs. RFP Time	E,Q				A	E			E
QA/QC Plan for Design	Q		Q		A		Q		
QA/QC Plan for Construction	Q		Q		A		Q		Q
D-B Team Organizational Structures	Q		Q						A
Changes to the Contracting Process	E,Q		Q	Q				Q	A
Traffic Impacts Under D-B vs. D-B-B	E,Q								
Required Investment Comparison	E,Q		Q		A			A	A
Stakeholder Feedback	Q	A	Q	Q		Q	Q	Q	A
D-B Benefit Expectations vs. Realization	A,E,Q	A	E,Q	A,E,Q	A,E	A,E,Q	A,E,Q	A,E,Q	A,E,Q

WSDOT Process Models

The independent evaluation will deliver recommendations and comparisons of the D-B process. To better understand this process, the evaluation team is preparing models of the D-B and the D-B-B process. These models, termed process models, attempt to represent the activities engaged in and the knowledge transfer within the operation of WSDOT.

The evaluation team is using an IDEF methodology to analyze the D-B process. IDEF is stands for Integrated DEfinition. The IDEF methodology was developed in the mid-1970's by the US Air Force as part of its Integrated Computer-Aided Manufacturing (ICAM) program. This Air Force program was established to improve manufacturing operations (Rensburg 1995). The ICAM program used the language notation Structured Analysis and Design Technique (SADT) to model functions, data and dynamic elements of the manufacturing operations (Godwin 1989). The IDEF methodology resulted from the ICAM program and was influenced by the SADT methodology.

The specific IDEF method to be used for the WSDOT evaluation is IDEF0. An IDEF0 model consists of an ordered collection of diagrams, which are related to each other in a precise manner to form a coherent model of the system under investigation (Godwin 1989). IDEF0 begins with a general statement of the process, then breaks the processes down, or decomposes the process, to finer levels of detail. This process is similar to a work breakdown structure used when scheduling construction activities. The goal is to define the process in terms of its components at the lowest level.

IDEF0 accomplishes this definition using a graphical language consisting of boxes and arrows (Godwin 1989). *Boxes* indicate *activities* and *arrows* indicate four different *system elements*:

1. Inputs;
2. Controls;
3. Outputs; and,
4. Mechanisms;

Activities: Named processes, functions or tasks that occur over time and have recognizable traits.

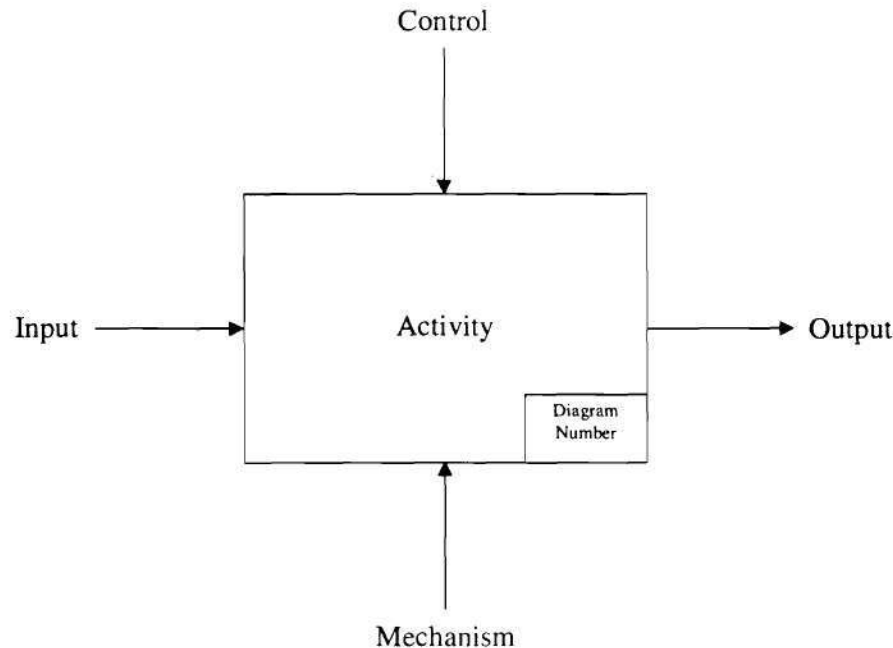
Inputs: The information/material needed to produce the output of the activity.

Controls: The information/material, such as standards, policies or guidelines that constrain an activity.

Outputs: The information or material produced by the activity.

Mechanisms: The people, machines or existing systems that perform or provide the energy to the activity.

The system elements are connected to the activities as shown in the figure on the next page.



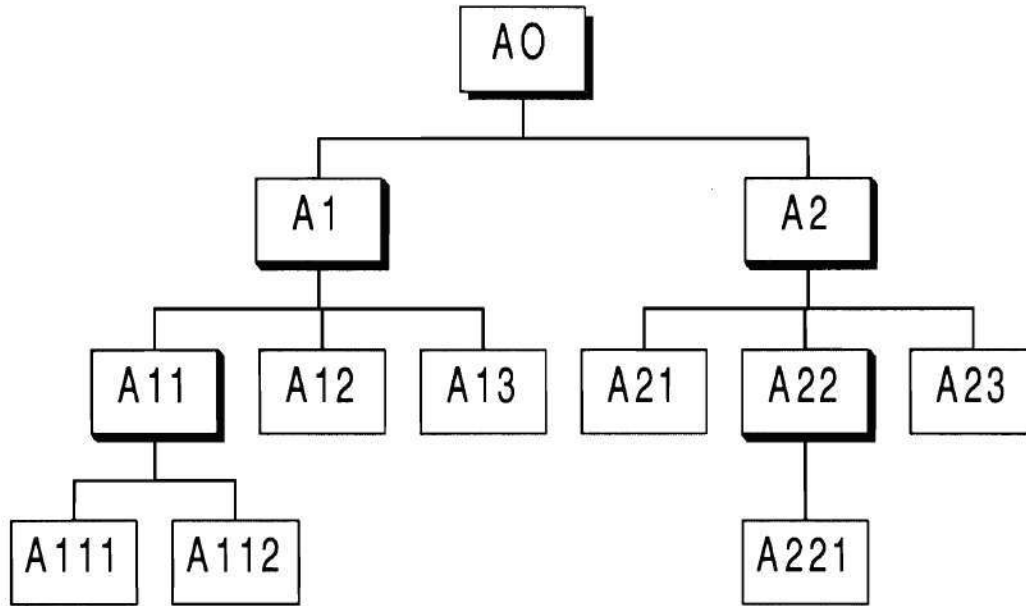
IDEF Modeling Notation

The placement of an arrow indicates how that information is to be used. Information or materials that will be consumed or changed during the activity are placed to the left of the activity box. Information that remains unchanged at the end of an activity, such as an organizational policy or budget, is considered a control and is placed at the top of the activity box. People or equipment used to change the inputs into outputs enter the activity box from the bottom as mechanisms. Outputs leave the activity box from the right. This labeling system is consistent for all activity boxes in the model.

Activity boxes are linked together by the flow of information that passes between activities. Outputs from one activity become inputs or controls on another. Mechanisms and controls can be applied to multiple activities. Inputs, such as proposals, can be split into their component parts. In the case of a proposal, it would be broken out into its technical components and distributed to the appropriate expert review team. Outputs can be combined into a single product, such as sand, cement and water combine to form concrete. Splitting and joining are shown in the model as the diverging and converging lines respectively.

Complex processes are decomposed using different levels to present detail. For example, the activity "Construct Concrete Wall" is made up of a sequence of more detailed activities like "Build Forms," "Place Reinforcing," and "Place Concrete." Each of these more detailed activities can be further decomposed into their respective sequences of activity. This relationship is called the Parent-Child Relationship. A "Parent" activity is the source of multiple "Child" activities. A "Child" activity is a step in the process involved to create the parent activity. A "Child" that can be broken down into more detail is also the "Parent" for the next lower level of detail. For example, the child "Place Concrete" from the above example would be the parent of "Deliver Concrete," "Pump Concrete," and "Vibrate Concrete" in the next lower level. The IDEF0 method procedures recommend limiting the number of child activities to between 3 and 6 per parent.

The top most level is a general statement that describes the entire process. For the WSDOT evaluation this level will be the "WSDOT Design Build Process". This level is always labeled "A0". The Parent-Child labeling procedure followed in IDEF0 is detailed in the figure below. Note how the parent activities have a dark shadow.



IDEF Labeling Notation

The evaluation team performed a process model, literature review to investigate the available modeling techniques. The IDEF model was selected because it is the most appropriate for accurately modeling the WSDOT D-B process, it is a widely accepted methodology for problem of this type and modeling software is available that supports this methodology. The modeling software is supplied by Knowledge Based Software, Inc. and will enable efficient model production. The attached model is a working draft that represents the D-B process to date. This draft model was developed from the WSDOT Design-Build Process Final Report and correspondence with WSDOT staff. As new information becomes available the model will be expanded. The evaluation team plans to use these models to measure the impacts of D-B on WSDOT staff effort and identify areas of improvement for both the D-B and the D-B-B processes. Once the models are created, simulation software will apply duration and variability to identify areas of inefficiency and delay.

The IDEF0 model describes the allocation of resources for an organization, but it does not provide information on duration or variability in the process. The evaluation team will use simulation software to model how the system performs once the process is understood. Process simulation will offer two distinct advantages. First, the evaluation team will be able to conduct a sensitivity analysis. A sensitivity analysis will define the activities that are most critical or time-consuming for WSDOT. Second, the computer simulation will also allow the evaluation team to make more precise predictions for management time on future projects.

A draft process model for the WSDOT D-B process and example element are shown in Appendix VI. As the evaluation progresses, the evaluation team will be working closely with the WSDOT staff to build accurate process models for both the D-B and D-B-B processes. Computer simulation will accurately measure staff time on pilot projects and future projects. These measurements will yield quantitative differences between the two processes and help to define the most critical elements in the processes.

Conclusions and Future Research

The Design-Build Pilot project evaluation is proceeding on schedule. This progress report summarizes the evaluation team's understanding of the WSDOT D-B process, explains refinements to the proposed evaluation measurement criteria, discusses obstacles and concerns for the continuing evaluation, provides a critical review of other state DOT's D-B findings and presents a preliminary model of the D-B process. Upon review of evaluations from other State D-B programs, it is apparent that this will be one of the most detailed and scientific. Although the evaluation scope is extremely aggressive, the evaluation team is confident that the objectives can be met with the help of the WSDOT Design-Build Pilot Project team.

The evaluation team has collected D-B process documentation from numerous other states and the WSDOT process is definitely one of the best-planned D-B implementations to date. The guidelines and procedures being established through this pilot process will be extremely valuable to WSDOT as well as other State and Federal agencies. Continued documentation and dissemination of the process will enhance numerous other transportation projects across the United States.

The authors of this evaluation report would like to acknowledge efforts of the WSDOT Design-Build Pilot Project team, especially Rick Smith, Todd Harrison and Mike Clark. Without their continuing support, this evaluation would not be possible.

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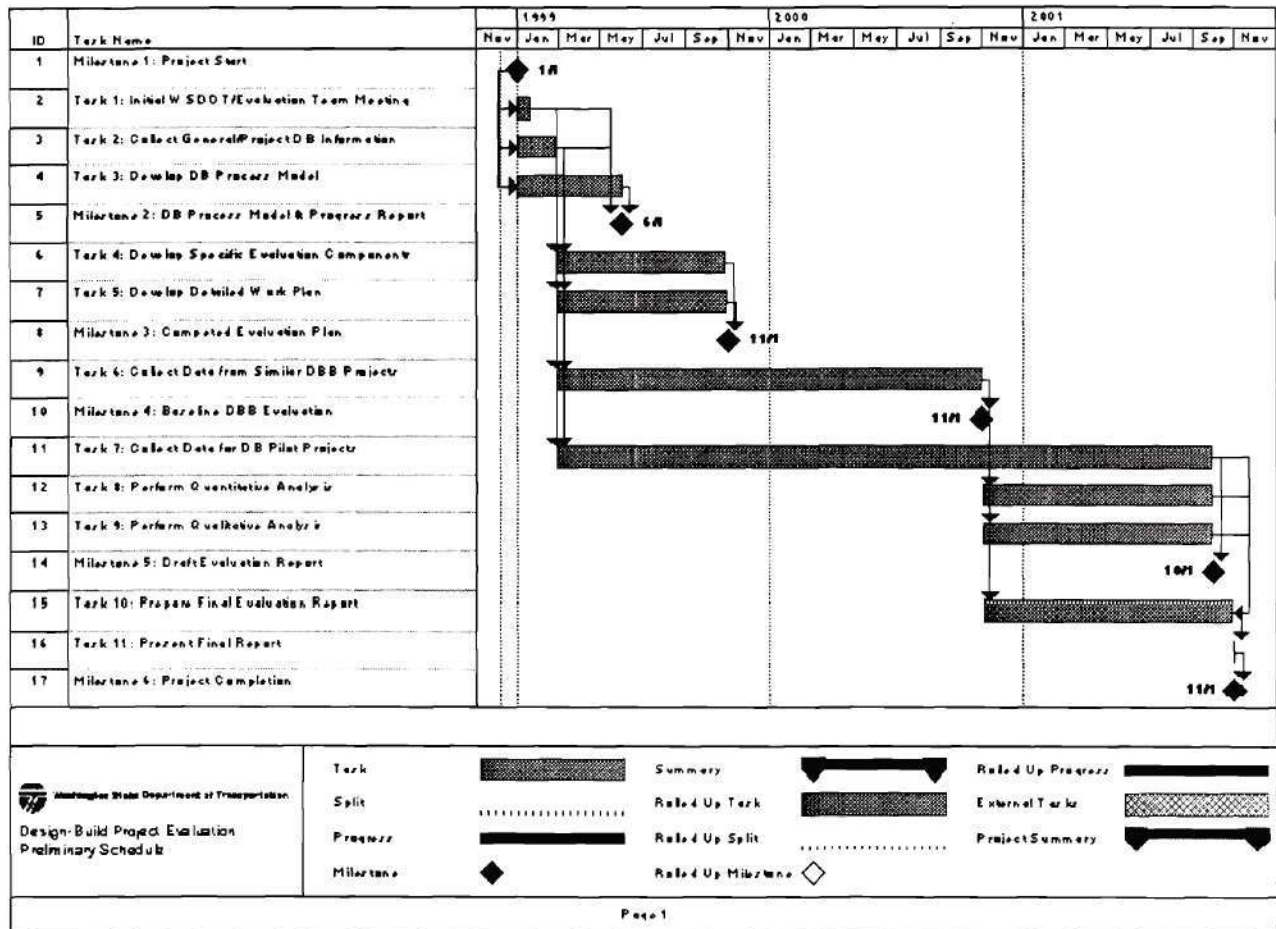
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Related Web Pages

State	DOT Home Page	D-B Specific Page
S. Carolina	http://www.dot.state.sc.us/	
Utah	http://www.dot.state.ut.us/	
Colorado	http://www.dot.state.co.us/	http://www.dot.state.co.us/public/public.htm
Indiana	http://www.ai.org/dot/index.html	http://www.state.in.us/dot/i65b.htm
Washington	http://www.wsdot.wa.gov/	http://www.wsdot.wa.gov/designbuild/db/index.htm
New Jersey	http://www.state.nj.us/transportation/	
Arizona	http://www.dot.state.az.us/index.html	
Ohio	http://www.dot.state.oh.us/	http://www.dot.state.oh.us/dist11/octrel.htm http://www.dot.state.oh.us/morgue/OCT24.HTM
Florida	http://www.dot.state.fl.us/	http://www.dot.state.fl.us/cc%2Dsrvcs/ads/spec_fl.htm
Others	http://www.transdata.com/dots.htm	

Appendix II: Evaluation Schedule



Appendix III: 2-19-99 Meeting Minutes

Executive Summary

The Georgia Institute of Technology has been selected to provide an objective evaluation of the Washington State Department of Transportation Design-Build Pilot Project. An initial meeting was held on February 19th, 1999 between the WSDOT design-build team and the evaluation team. The purpose of this meeting is discuss and refine project objectives. The product of this initial meeting is a memorandum of understanding in the form of detailed meeting minutes describing the major decisions, milestones obstacles and objectives of this evaluation.

Evaluation Time Table:

Begin Date: February 17, 1999

End Date: November, 2001 or two months after latest project completion

Major Evaluation Deliverables:

1. First Progress Report (Includes a Process Model)
2. Second Progress Report (Includes Baseline Measurements)
3. Third Progress Report
4. Draft Report
5. Final Report

Evaluation Scope Clarifications and Additional Objectives:

The following is a summary of scope clarifications discussed in the initial meeting. For a complete scope of the evaluation, please refer to the contract and proposal.

General Information

- Provide recommendations for Design-Build use in WSDOT.
- Compare WSDOT management effort for Design-Build verses Design-Bid-Build.
- Compare the administrative burden required to prepare Invitation for Bids for Design-Bid-Build projects verses that to prepare Request for Proposals for Design-Build projects.
- Develop baseline of recent Design-Bid-Build projects to compare to the Design-Build projects.
- Quantify changes to the contracting process.
- Investigate Design-Build team organizational and functional structures.
- Identify and analyze problem areas and/or controversial topics.

Design Phase Information

- Identify time savings of removing alternative design comparisons from WSDOT's scope.
- Estimate design costs if the projects had design been done with a Design-Bid-Build process.
- Collect and analyze participant feed back on the selection process and the WSDOT QA/QC proposal.

Construction Phase Information

- Time impacts for inspection personnel
- Determine where Design-Build teams were able to compress the schedule
- Traffic impacts under Design-Build verses Design-Bid-Build

Investigations into funding issues for Design-Build projects and assessing value of prescriptive verse performance specifications were determined to be outside the scope of this investigation.

Morning Meeting

Date: February 19, 1999
 Location: WSDOT Office, Olympia, WA
 Time: 10:00 a.m. – 1:00 p.m.

Attendees:

WSDOT	Phone	Fax	e-mail
(RS) Rick Smith	(360) 705-7365	(360) 705-6870	smithrick@wsdot.wa.gov
(MC) Mike Clark	(360) 905-2110	(360) 905-2096	clarkm@wsdot.wa.gov
(KW) Ken Walker	(360) 705-7017	(360) 705-6810	
(TH) Todd Harrison	(360) 738-6213	(360) 676-2218	harrist@wsdot.wa.gov
Georgia Tech			
(KM) Keith Molenaar, Ph. D.	(404) 894-0171	(404) 894-2278	keith.molenaar@ce.gatech.edu
(JS) Justin Sencer, E.I.	(404) 894-0171	(404) 894-2278	gte072m@prism.gatech.edu

Action Items (Ball-In-Court)

The following is a summary of the action items from the meeting discussions.

JS - Prepare meeting minutes for 2-19-99 meeting

KM - To research how FDOT developed unit costs for their analysis

KM - To look into Jim Ernzen report from the University of Arizona regarding worker exposure

KM - To develop a list of pilot project milestone items (shopping list) to be copied to Georgia

KM - To contact CH2MHILL to discuss their involvement with the WSDOT Design-Build Pilot Program

MC - To provide access of ftp site to Georgia when site is available

RS - To continue trying to establish video conferencing capabilities

RS - To send Georgia WSDOT's lists of contacts

RS - To get a copy of the Vancouver project RFP to Georgia

TH - To copy Georgia on the milestone schedule for the Bellingham project

TH - To provide access of ftp site to Georgia when site is available

WSDOT - Brainstorm to determine areas of interest Georgia could assess as an independent evaluator that WSDOT might not be otherwise able to get

WSDOT - Brainstorm to determine categories of work where costs can be measured for future comparisons

Morning Meeting Minutes

Where appropriate initials of attendees have been used. The Georgia Institute of Technology will be referred to as Georgia.

KM explained Georgia is interested in four groups of contacts:

- Design-Build team selected from RFP
- Design-Build teams not selected after RFP
- Design-Build teams not qualified after RFQ
- Contractors/Consultants who chose not to participate

RS explained Georgia was selected to provide the outside evaluation. The legislators have requested an evaluation of the Design-Build Pilot Program. They did not specify the evaluation had to be external.

WSDOT decided an outside evaluation would provide an independent assessment of the program. The evaluation will provide recommendations for Design-Build use in WSDOT.

KM would like to emphasize a comparison of the managerial time required by the WSDOT for Design-Build verse Design-Bid-Build. Georgia would like to see if Design-Build is a good use of time for the WSDOT. Georgia will be asking for a lot of measurements of WSDOT staff time and the level of effort that is required for the Design-Build process.

RS distributed the attached cost accounting handout. It lists areas of cost WSDOT will attempt to track:

- Normal Project costs
- Costs different than normal projects costs that would continue with Design-Build
- Costs related to one project that would not continue with subsequent Design-Build projects

KM said Georgia would like to estimate what Design-Build design costs would have been had the design been completed using a traditional Design-Bid-Build process.

KW asked why the design cost is important. He asked why not just compare overall project cost to similar projects.

RS said knowing the design cost may be of internal interest and other stack holders may be curious to see if there is a cost saving in design.

KM suggested the legislators might want to know if design costs less but construction costs more or vise versa.

KM said that if determining the design costs is something WSDOT is not comfortable in requesting in the RFP, then as an independent evaluator Georgia may be able to get this information directly from the Design-Builder.

RS discussed the expected organization of the Design-Build teams and their surety arrangements.

KM said Georgia would be preparing a process model of the Design-Build process. Part of the model will require supplying WSDOT personnel with time sheets to keep track of their hours.

KM reviewed the general scope of the evaluation. Georgia is to provide an outside evaluation of the WSDOT Design-Build pilot program. The evaluation is scheduled to take three years. The first year will establish the base lines for the measurements that will be recorded during project duration. Georgia wants to create a baseline of recent Design-Bid-Build projects that can be used to compare to the Design-Build projects.

KM asked if there are any Design-Bid-Build projects currently going on that are similar to the pilot projects.

TH said he has two projects that are very similar to the pilot project.

KM said the measurement of management costs on those projects would be very important. Measuring bid costs and completed project costs will be fairly easy to get as they are already tracked, but the internal management costs for the projects would be a little harder to get at after completion.

KM explained the second year of the evaluation would consist of collecting data on the pilot projects and any concurrent Design-Bid-Build projects. The third year of the evaluation would be the time that quantitative costs (completed project data and completed management costs) are analyzed. Questionnaires will be sent to the companies and WSDOT personnel involved with the projects to get their assessment of the process.

KM discussed the five major deliverables from Georgia.

1. First Progress Report (Includes a Process Model)
2. Baseline Measurements
3. Second Progress Report
4. Draft Report
5. Final Report

RS said the final report would be prepared by November 2001 or two months after the last project is completed.

KM asked if WSDOT is requiring completed design prior to start of construction.

RS answered that acceptance of the proposal was equivalent to acceptance of the design.

MC & TH gave descriptions of the Pilot Projects.

KM asked if there is similar Design-Bid-Build projects of this character.

MC said that there are similar projects.

KM asked what types of unit costs were asked for in the similar project that might be asked for in the Design-Build project. KM asked WSDOT to determine additional costs that could be asked for of larger scale than just unit costs. KM suggested creating a list of Design-Build costs that reflect data kept in the WSDOT historic database. Historic data should be grouped into larger sections of costs to keep the level of detail asked of the Design-Build teams to a minimum.

KM requested WSDOT determine different categories of work where costs can be measured for future comparisons.

TH described similar projects to the I-5 Bellingham remodeling project:

- Six miles of renovation was just completed south of the proposed project.
- Renovation work North of the project will be very similar but Design-Bid-Build

KM asked if the management costs for the adjacent Design-Bid-Build projects would be available to Georgia Tech.

TH answered the management costs will be available and that both projects will be very similar to the Design-Build project.

KM said that Florida DOT had made comparisons as to the type of construction was successful under Design-Build. (Author's note: Building Structures and Bridges were found to be suitable, Resurfacing and Multi-Lane construction were found to be unsuitable based on qualitative questionnaires of the participants)

KM said the different projects will allow for a good mix of reviews and reactions to Design-Build and the similar projects that are on going will allow for valuable measurements for comparisons.

The Washington State construction season is from May to October.

MC questioned whether the evaluation would go into investigating the value of prescriptive specifications. KM and RS said that investigation is outside the scope of this evaluation.

RS explained the projects do not have to be completed by April of 2001 but that WSDOT has authorization to enter into Design-Build projects until that time.

RS explained the Georgia progress reports will be included in the WSDOT progress reports to the Washington Legislature. WSDOT will be reporting to an interim committee during summer and again during the January 2000 legislative session. Reports will continue during the summer and January session until the pilot projects are complete.

RS explained the Design-Build Pilot Project is allowing the WSDOT to test Design-Build construction as a tool. If it is successful and WSDOT is pleased with the process, steps will be taken to write Design-Build use into law. WSDOT is sincerely interested in an objective evaluation. If the process is not successful WSDOT wants to be told it is not successful.

KM requested WSDOT set up a communication schedule with Georgia. Georgia will prepare a list of milestones the evaluation team would like to see, such as RFP's, names of proposing teams, draft & final RFQ's/RFP's, evaluations, short list of Design-Builders.

KM asked how Georgia would be able to get a hold of the stake-holders who decided not to participate. RS suggested the Washington AGC and Consulting Engineers Council.

RS asked TH & MC to allow Georgia access to their ftp sites when these sites become available.

RS suggested Georgia speak with CH2MHILL. CH2MHILL was instrumental in the development of the WSDOT Design-Build process and they may have some valuable input to the evaluation.

Georgia will start with the rough process model that was prepared for the WSDOT Report. This model is not yet complete and will be expanded upon by Georgia through the use of surveys to WSDOT personnel.

The evaluation will try to make use of video conferencing.

WSDOT organizations for in-house design and job cost accounting were discussed. CH2MHILL will be on the WSDOT design staff to help develop the RFP's.

KM discussed process for creating Design-Build specifications. Measuring the differences in Design-Bid-Build specifications will have to be determined once the specifications have been written. MC said he would probably have CH2MHILL write the specifications. The initial learning curve for writing the prescriptive specifications might be significant. Georgia will do some sensitivity analysis to determine how much impact writing specifications had on the WSDOT.

KM said the evaluation team would like to compare the design time for Design-Build verses Design-Bid-Build. WSDOT may find it useful to know if design takes more time even though construction time may be shorter. Georgia to look at the time required to prepare an RFP for a Design-Bid-Build projects verses a Design-Build project.

MC sees a time saving in design by eliminating the need for WSDOT to consider design alternatives. Typical Design-Bid-Build jobs require WSDOT staff to investigate multiple alternative designs. Design-Build eliminates this task. The time required for alternative design investigation might be used to develop the RFP. Georgia to try to see if this will happen.

Georgia will also try to determine if bringing a Design-Bid-Build project to 30% design for out-sourcing verses bringing a Design-Build project to 30% for an RFP requires significant WSDOT staff investment changes. A goal for the evaluation is to determine if there is an additional internal WSDOT cost to prepare and administer a Design-Build project that would make it unattractive as a tool for construction.

KM asked if funding issues for Design-Build was in the scope of services expected from Georgia.

RS answered the evaluation might discover these issues during the qualitative analysis but there is no need for Georgia to try to investigate funding for Design-Build projects.

KW said administration costs are known in Design-Bid-Build. Design-Build administration costs may not change but they will be determined after the contract has been formed.

KW said Georgia is to look for any changes to the contracting process after the contracts are written.

Georgia will be interviewing the proposing teams for feed back on the selection process and the WSDOT QA/QC proposal. The survey results will be included in the interim report to WSDOT in November.

WSDOT anticipates administrative burden for process payments will be less than on Design-Bid-Build projects. Georgia will try to qualitatively determine if the inspectors of projects will require more or less time to inspect the jobs.

Afternoon Meeting

Date: February 19, 1999
 Location: WSDOT Office, Olympia, WA
 Time: 1:00 p.m. – 2:00 p.m.

Attendees:

WSDOT	Phone	Fax	e-mail
(RS) Rick Smith	(360) 705-7365	(360) 705-6870	smithrick@wsdot.wa.gov
(MC) Mike Clark	(360) 905-2110	(360) 905-2096	clarkm@wsdot.wa.gov
(TH) Todd Harrison	(360) 738-6213	(360) 676-2218	harrist@wsdot.wa.gov
(PB) Pasco Bokotich	(360) 357-2606	(360) 357-2601	bakotip@wsdot.wa.gov
(B) Brian Ziegler	(360) 705-7231		ziegleb@wsdot.wa.gov
(D) Denny Jackson	(360) 709-5401		
(RM) Rudy Malfabon	(360) 705-7821		malfabr@wsdot.wa.gov
(M) Martin Pietz	(360) 705-7974		pietzm@wsdot.wa.gov
(JC) John Conrad	(360) 705-7800		conradj@wsdot.wa.gov
Georgia Tech			
(KM) Keith Molenaar, Phd.	(404) 894-0171	(404) 894-2278	keith.molenaar@ce.gatech.edu
(JS) Justin Sencer, E.I.	(404) 894-0171	(404) 894-2278	gte072m@prism.gatech.edu

Afternoon Meeting Minutes

Georgia's goals are to get some quantitative measurements for the pilot projects to begin to make comparisons with Design-Bid-Build projects. Data from other states will be used to help broaden the amount of project data available. Quantitative data will be pursued wherever possible and practical. Other measurements of man-hours and management resource impacts will be addressed through qualitative surveys and interviews of WSDOT staff.

Georgia will try to get the design cost data from the Design-Build teams after the proposal is awarded rather than WSDOT asking for this information through the RFP.

Brian said schedule compression would be the biggest benefit to Design-Build. Georgia to evaluate where teams were able to compress the schedule. For example finding the level of design required before construction can start on items such as bridges.

Brian requested an investigation of the Design-Build project team organizational structure. Determine how the information was shared, the safety record under Design-Build, risk distribution and how well the teams were able to work together.

Georgia will be looking at the areas that work well under Design-Bid-Build that did not work as well or were better under Design-Build.

Marty asked for an investigation into the quality of the people hired for quality testing and an investigation into how often the quality of the work completed was called into question.

RS would be interested in seeing what problems developed from completed Design-Build plans and specifications to the WSDOT format. Were there any problems in the creation of as-builts?

RS asked for input from the proposing teams on how the design process is proceeding with regard to no WSDOT approvals or review for design after accepting the proposal. Gathering any suggestions they may have for the process.

The number of traffic impact days could be compared. Overall project time may be saved but traffic impacts may be longer. This will be a measurable criterion for comparison.

Appendix IV: Non-Participant Questionnaire

This appendix contains a draft of the first, stakeholder questionnaire. The intent of this questionnaire is to gain feedback from those engineering and construction firms who chose not to participate in the D-B Pilot projects. The evaluation team will send the questionnaire to companies that showed an interest in the D-B process but chose not to submit an POQ for the pilot projects. This questionnaire will attempt to define and quantify any resistance to the use of D-B from the Washington design and construction community.

In order to maintain the actual format, the stakeholder questionnaire is presented on the next two pages.

WSDOT Design-Build Program Evaluation

Stakeholder Questionnaire

The Washington State Department of Transportation has contracted the Georgia Institute of Technology to perform an independent evaluation of the WSDOT Design-Build Pilot Process. The attached questionnaire will facilitate the evaluation of the design-build process.

You have been chosen to participate because your firm showed an interest in the **SR5 PCCP Rehabilitation Design-Build project**, but did not submit a Proposal of Qualifications.

Please take a few minutes to complete this questionnaire, as your comments are critical to the effective development of this new Design-Build process.

The results of this study will be made available to you upon completion of the analysis. Thank you for your assistance.

Section I: Non-Design-Build Related Issues

1. Did your company decided not to participate for non-Design-Build related issues, such as:
- Large backlog of work
 - Projects not in your geographic region
 - Projects outside of your expertise

☐ Yes ☐ No

Please explain: _____

If the answer to question 1 was "Yes", please skip to Section IV.

Section II: WSDOT Design-Build Related Issues

2. Did your firm have enough **time to respond** to the RFQ?

No Factor Needed More Time
1 2 3 4 5 6

3. Did you anticipate the **organization of the WSDOT Design-Build Program** was not going to be sufficient for a successful project?

No Factor Too Disorganized
1 2 3 4 5 6

4. Did your firm feel that the **inexperience of the WSDOT Design-Build Program** would lead to problems with the project?

No Factor Too New
1 2 3 4 5 6

5. Was the Design-Build process **clearly explained**?

No Factor Confusing
1 2 3 4 5 6

Section III: Company Design-Build Related Issues

6. Would the Design-Build process shift too much **project risk** onto your company?

No Factor Too Much Risk
1 2 3 4 5 6

7. Did your company feel a Design-Build project has a small **potential for profit**?

No Factor Not Profitable
1 2 3 4 5 6

8. Did your firm have **difficulty finding a partner** to complement your services for a Design-Build project?

No Factor No Partner
1 2 3 4 5 6

9. Would the **conversion to Design-Build operations** be too difficult/costly for your company at this time?

No Factor Too Difficult
1 2 3 4 5 6

10. Would your company provide Design-Build services for future projects?

☐ Yes ☐ No

11. Other:

No Factor Significant Factor
1 2 3 4 5 6

12. Other:

No Factor Significant Factor
1 2 3 4 5 6

For example:

- What would have allowed your company to participate in the Design-Build process?
- Explain the changes necessary for your company to participate in future Design-Build Projects.
- Does your company believe WSDOT should engage in Design-Build?

[illegible]

Please fill out this section so that we may forward the results of this survey.

Your Name _____

 Position/Title _____

 Agency or Company _____

 Department _____

 Street Address or PO Box _____ Suite # _____

 City _____ State _____ Zip Code _____

 Telephone Number _____ Fax Number _____ E-mail Address _____

 Annual Company Construction Volume \$ _____

What type of agency or company are you employed by?

- ☐ Design-Build
☐ Architecture/Engineering
☐ General Contracting
☐ Construction Management
☐ Other _____

Appendix V: SEP-14 Description

Work Plan Requirements SPECIAL EXPERIMENTAL PROJECT NO. 14 (SEP-14) INNOVATIVE CONTRACTING PRACTICES

FHWA Headquarters' SEP-14 approval is necessary for any non-traditional construction contracting technique which deviates from the competitive bidding provisions in 23 USC 112. Any construction contract which utilizes a method of award other than the lowest responsive bid (or force account as defined in 23 CFR 635B) should be evaluated under SEP-14. These non-traditional contracting techniques may include best value, life cycle cost bidding, qualifications based bidding and other methods where cost and other factors are considered in the award process.

Innovative contracting practices, proposed to be evaluated under Special Experimental Project No. 14 (SEP 14), should be submitted, by the FHWA Division Office to Headquarters (HNG-22) for approval (please send a copy to the appropriate FHWA Resource Center contact person). Review comments and recommendations made by the division and by the region should accompany the proposal. Submittals should be made early in the development of the project(s) in order that Headquarter's review comments can be incorporated in the project design and/or documents.

The basic component of an SEP 14 proposal should be a work plan which includes a brief description of the innovation to be evaluated and a proposed evaluation plan. It is recommended that draft special provisions, pertinent to the innovative practice, also be included if available at the time of the submission. Design-build proposals should describe the proposed procedures for selecting the successful firm. The following items should be addressed in the work plan:

Purpose: A brief description of the innovation which is to be evaluated and the expected results.

Scope: A brief discussion as to how the experiment will be conducted, including the number of project(s), a description of the location, existing conditions, etc.

Schedule: An approximate schedule for the project(s) including: advertisement, letting, award, project completion, and evaluations and reports.

Measures: A brief description of how the innovation is going to be evaluated (i.e., cost savings, time savings, improved quality, etc.).

Reporting: Both an initial and a final report should be prepared for all projects. The need for an intermediate report should be determined based on the complexity of the experiment and the length of time between completion of the work and completion of the experiment. All reports should be forwarded to Headquarters (HNG-22).

The initial report should be prepared approximately at the time of project award and should discuss any industry reaction to the innovation and any identifiable effects on the bids received. A copy of the bid tabulations should be included.

Intermediate reports should be prepared upon completion of the work and/or periodically until completion of the experiment. These reports should discuss the effects on work performance and monitoring, quality, completion time, claims, and other contract administration or legal issues.

The final report should be prepared upon completion of the experiment and should contain an overall evaluation of the innovation. Suggestions for improvements, pitfalls to avoid and a recommendation as to further use of the innovation should be included in the final report.

United States Department of Transportation - Federal Highway Administration Contract Administration Group (HNG-22), Highway Operations Division, Office of Engineering
Last Update January 1997

Appendix VI: Draft D-B Process Model

WSDOT

A0: Design-Build Process

A1: Preliminary Design & Environmental Documentation

A11: Collect Base Data

A111: Traffic Analysis

A112: R/W Costs/Estimated

A113: Preliminary Geotechnical Data

A12: Publish Environmental Document

A121: Conduct Environmental (NEPA/SEPA) Process

A13: Choose Solution

A131: Generate Alternatives

A132: Evaluate Alternatives

A1321: Maintenance Review

A1322: Constructibility Review

A1323: Value Engineering

A14: Develop Solution Design

A15: Verify Funding Adequacy

A2: Contract Development, Advertisement, Award, & Execution

A21: Project Documentation

A211: Prepare Project Description

A212: Prepare Scope of Work

A213: Prepare General Requirements/Contract

A214: Prepare RFQ/RFP

A22: Selection Step One

A221: Advertise Project

A222: Pre-Submittal Meeting

A223: Distribute RFQ

A224: Prepare Proposal of Qualifications

A225: Evaluate POQ

A23: Selection Step Two

A231: Pre-Proposal Meeting

A232: Distribute RFP

A233: Prepare Best and Final Proposal

A234: Award Contract

A2341: Evaluate Technical Proposal

A23411: Evaluate Technical Components

A234111: Construction Traffic

A234112: Design Documentation

A234113: Drainage/Stormwater

A234114: Environmental

A234115: Geotechnical

A234116: Maintainability

A234117: Materials, Pavement

A234118: Pre-Design Team

A234119: Structures

A2341110: Traffic Design

A2341111: Utilities

A23412: Review Technical Scores

A2342: Open Price Proposal

A2343: Calculate Best Value Design-Builder

A2344: Negotiate

A23441: QA/QC Plan Review

A23442: Agreement

A24: Contract Execution

Note: Diagrams for these activities are shown on the following page.